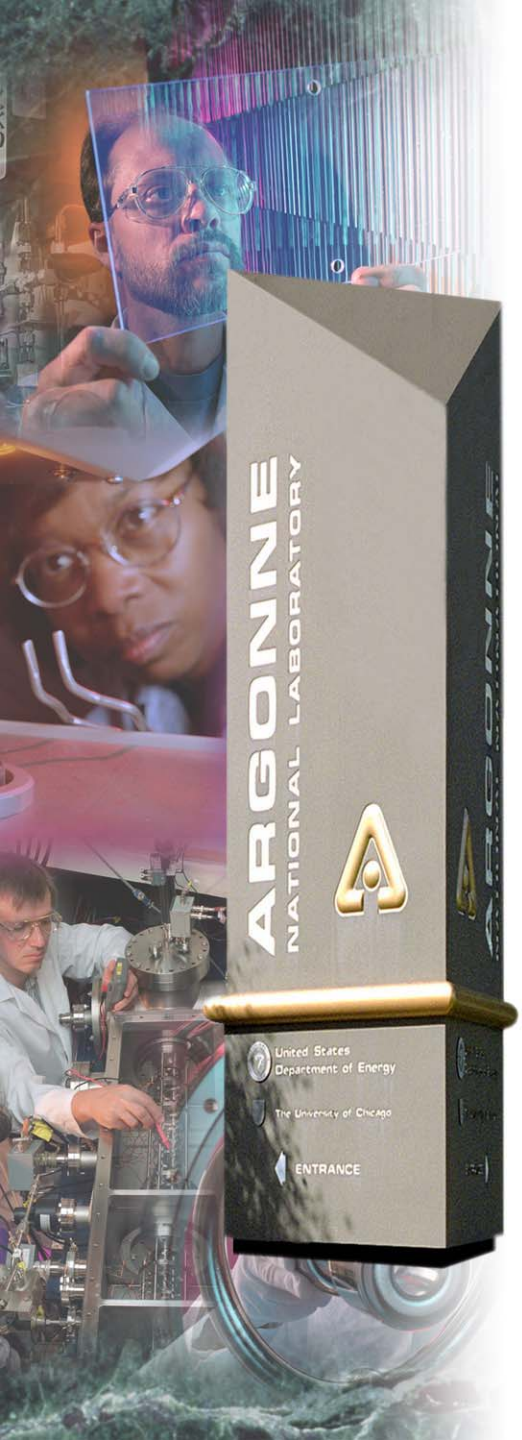

Best Practices In User Facilities

Presented to the Workshop on National Laboratories and Universities: Building New Ways to Work Together

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Office of Science
U.S. Department of Energy

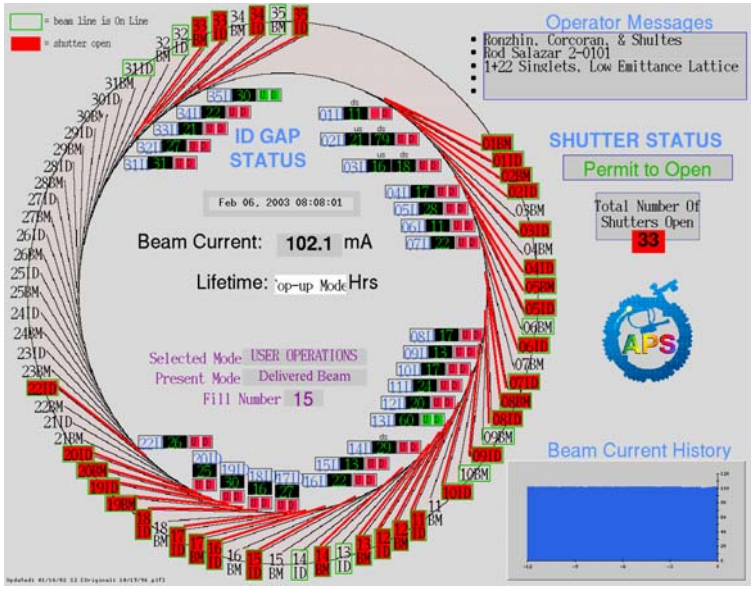
A U.S. Department of Energy
Office of Science Laboratory
Operated by The University of Chicago

The Advanced Photon Source

J. Murray Gibson

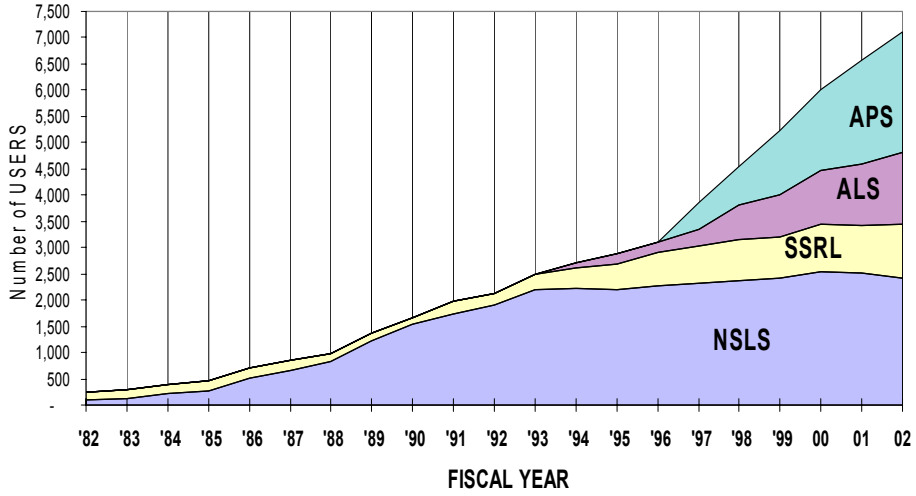
- **PhD University of Cambridge, Physics, 1978**
- **Bell Laboratories, Murray Hill NJ 1980-1991**
  - Distinguished Member of Technical Staff
  - Head, Electronic and Photonic Materials Research Department
- **University of Illinois, Urbana IL 1991-1997**
  - Professor of Physics and of Materials Science & Engineering
  - Associate Director Seitz Materials Research Laboratory
- **Argonne National Laboratory IL 1998-**
  - Director, Materials Science Division until 2001
  - Currently Associate Laboratory Director,
    Director, Advanced Photon Source
- **Research – thin films studied by novel diffraction and imaging**

APS becoming the nation's largest facility….



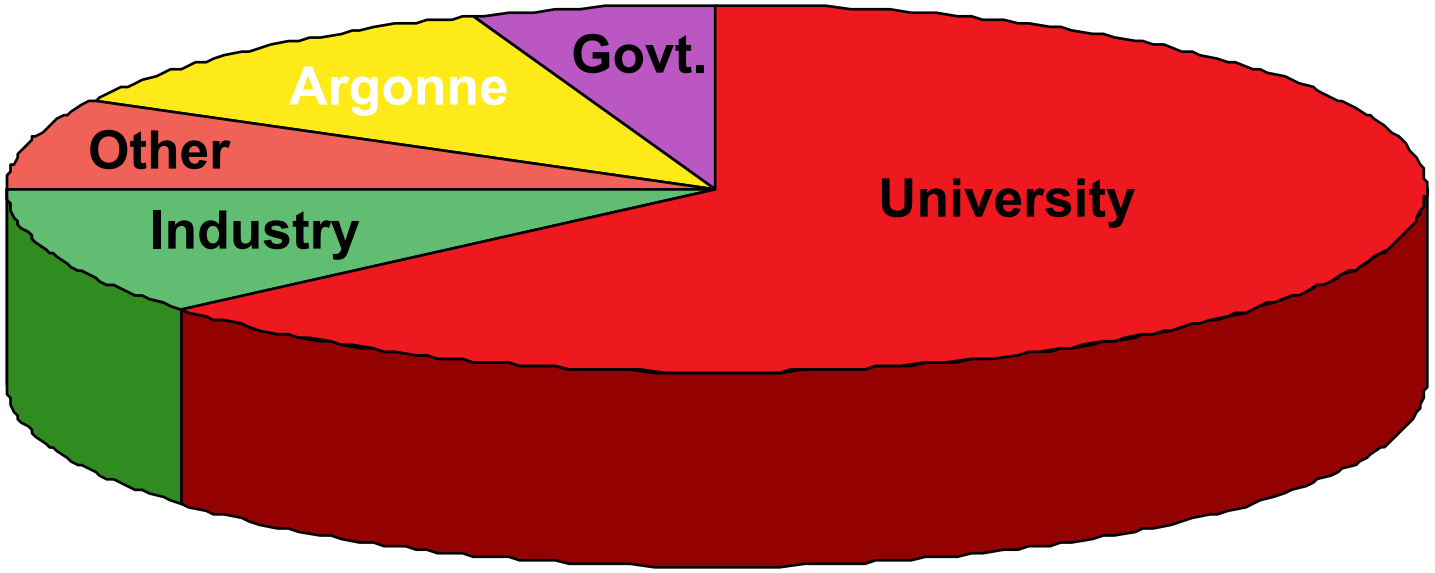
38 functioning beamports (25ID, 13BM)
68 total available

only 4 ID beamports are not yet committed

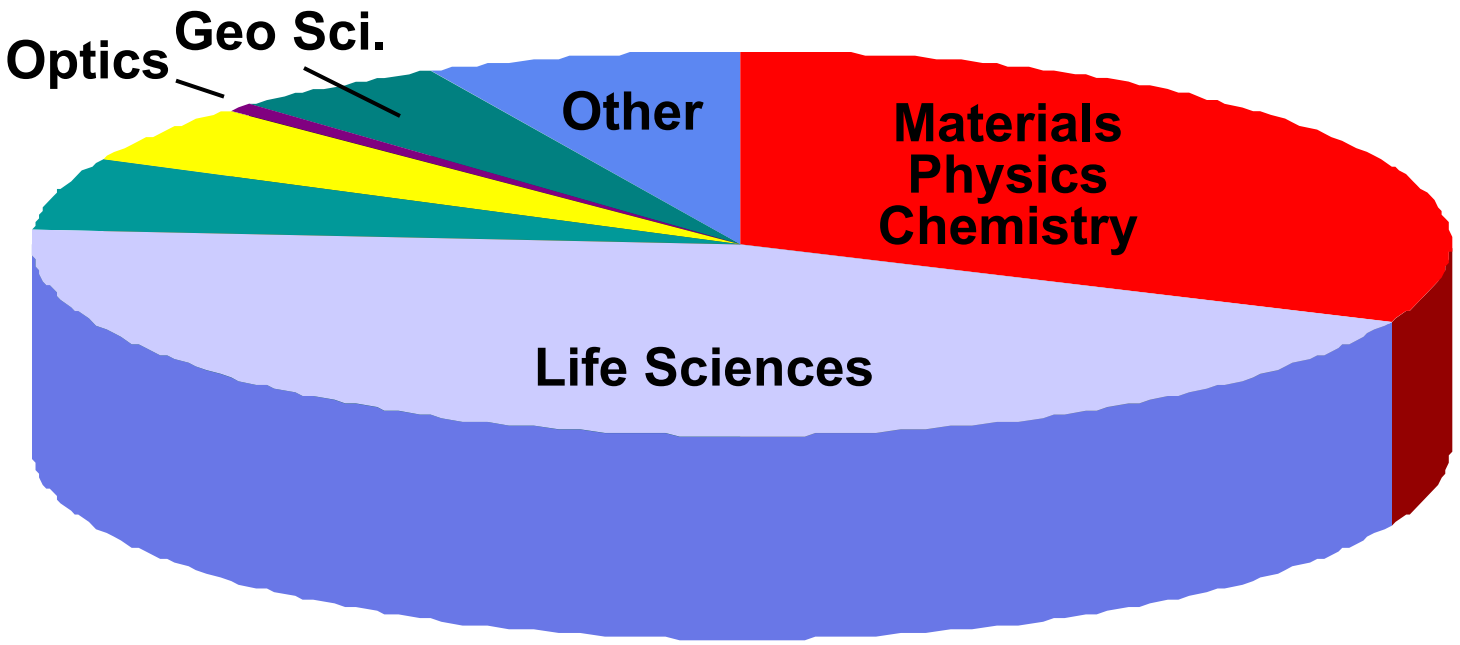


APS user community
over 5,000
will reach ~10,000 in a decade

Most of our users are from universities



Covering many fields of research…



General Users are Welcomed

APS Techniques Directory

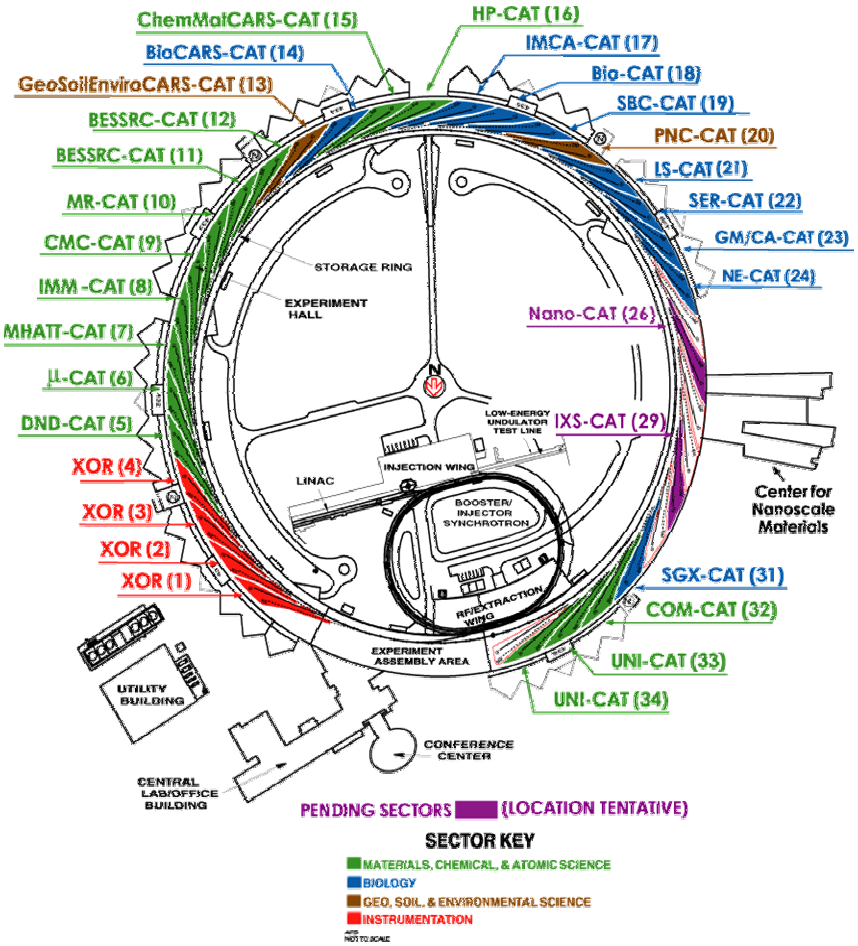
Technique	Beamline
Absorption/Spectroscopy	
Fluorescence spectroscopy	13-BM , 13-ID , 18-ID
Intensity fluctuation spectroscopy	12-ID , 7-ID
Photoemission spectroscopy (XPS)	12-ID , 4-ID-C
X-ray absorption fine structure (XAFS)	10-ID , 11-ID-D , 12-BM , 13-ID , 18-ID , 20-ID , 5-BM-D , 9-ID
X-ray magnetic circular dichroism (XMCD)	11-ID-D , 4-ID-C , 4-ID-D
Imaging	
EXAFS Microscopy	10-ID , 20-ID
Micro fluorescence	2-ID-B , 2-ID-D , 20-ID
Microprobe	13-BM , 13-ID , 2-ID-D , 20-ID , 7-ID
Phase contrast imaging	1-ID
Photoemission electron microscopy (PEEM)	4-ID-C
Radiography	1-BM
Tomography	13-BM , 2-BM , 5-BM-C
PROTEIN CRYSTALLOGRAPHY	
Macromolecular crystallography	14-BM-C , 14-BM-D , 14-ID , 17-ID , 19-BM , 19-ID , 5-ID
Multi wavelength anomalous dispersion (MAD)	14-BM-C , 14-BM-D , 14-ID , 17-ID , 19-BM , 19-ID

The Collaborative Access Teams at APS

- **Special Partnerships**

  ***Collaborative Access Teams* Build and Operate a Sector**

- **Traditionally make 25% time available to general users**



Pluses and minuses of CATs

- **CAT model has advantages and disadvantages**
- **Advantages**
  - Leveraging of funds
  - Outside drivers and partners for facility
  - Strong connection with universities
  - Creative diversity
- **Disadvantages**
  - Tendency to avoid specialization
    - *Increased operational burden*
  - Challenging to sustain stable operational support

Entrepreneurship

Stability and efficiency

APS has developed a more flexible partnering model

- **Attracts and retains intellectual investment from outside**
  - Universities and other research labs
  - Supports strong autonomous CATs
- **Provides appropriate access**
- **Based on competitive review**
- **APS taking more role in operational and construction phases, especially for physical/chemical science CATs supported by BES**

Partner users not only do great science but they leave the facility better for the general user….

e.g. instrumentation development,

new user community development, education and outreach..

Proprietary research

- **Important, but appropriately represents a small portion..**

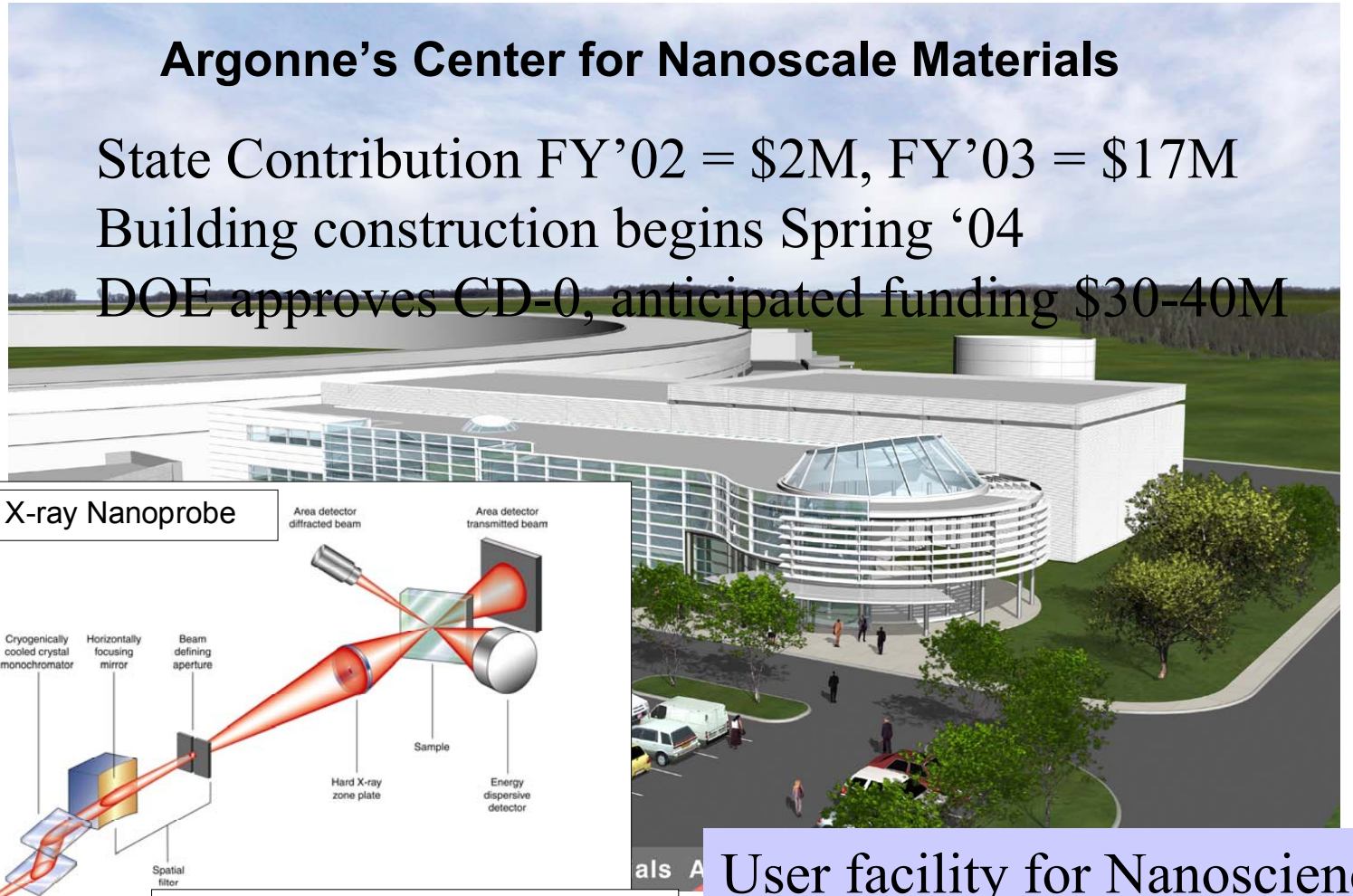
About 2-3% at APS, mostly related to drug companies

(12% of our users are from industry, but most non-proprietary)

- **For proprietary research, full cost recovery**
  - (facility only – this is an issue)
- **IP rights have been an issue, especially if assistance is needed**
- **Likely will be an even bigger issue for nanoscience centers**

Classified research is similarly important to facilitate…

Smaller facilities – nanotechnology



- ❖ Unique, versatile instrument to study individual nanostructures (30 nm spatial resolution)
- ❖ Quantitative atomic-scale structure, strain, orientation imaging
- ❖ Sensitive trace element and chemical state analysis
- ❖ Ability to penetrate overlayers, environments, fields

User facility for Nanosciences and Nanotechnology
http://nano.anl.gov/

Science and Technology

Why the national labs should house large facilities

- **Ecumenical**
- **Interdisciplinary**
- **Career paths for support staff**
- **Corporate organization appropriate for large facility management**
- **Multidisciplinary labs provide a valuable science context**
  - How did APS begin?
  - APS benefits greatly from ANL users
- **Have organizational flexibility to accommodate natural changes from construction to operation**
- **GOCO model is effective and involves universities**

Weaknesses of the national labs

- **Security and access**
  - (can be a strength for special facilities, e.g. biohazard)
- **Complex intellectual property issues (not unique)**
- **Joint appointments are good, but have not developed well in many places (exception is Berkeley)**
- **Challenge to retain a science context**
- **Human capital**

Strengths and weaknesses of Universities

- **Strengths**
  - Intellectual leadership
  - Education
    - *Not only cost-effective but highly leveraged*
  - => Should be the foundation of all research
- **Weaknesses**
  - Infrastructure and instrumentation support
    - *Extends to instrumentation development*
  - Faculty model dominates to the exclusion of other careers
  - Work best with individually driven research
  - Time scale of student education is long

National labs must choose what they do and not compete with universities
Should provide a resource to universities
Big facilities are obvious, but others include….
Teamwork, interdisciplinary, flexibility, small facilities
Case has not been effectively articulated……

NRC Committee on Small Facilities

- **Beginning to study small facilities in materials sciences**
- **Chair Robert Sinclair, Stanford (BPA/SSSC, NRC contact Tim Meyer)**
- **There is a crisis in the universities re support of small facilities**
  - Perhaps solved through regional considerations
- **But National Laboratories can provide some solutions as a resource to universities**

Diversity of research environments is powerful

- **Each model has strengths and weaknesses**
  - Diversity has been good in US, both lab types and agencies
- **Partnerships are essential**
- **Erosion of industrial research environments like AT&T Bell Labs must be compensated for in the National Labs and Universities**

A Few Other Best Practices from ANL/APS

- **Science Advisory Committee**
- **National and International co-operation with other facilities**
  - Can support some special expertise and solve common problems together
- **Stimulating joint appointments with local universities**

Dangers

- **Don’t compete with the users**
  - But you must have science within a facility staff
- **Don’t start with all the money**
- **Don’t assume operational support will materialize from outside the facility**
- **Don’t change too quickly, but change is healthy**

Summary

- **Large national facilities are a natural role for lab operation and university usage**
  - BES/ Office of Science are good stewards for large facilities
- **Large facilities need to develop strong partnerships (beyond general users)**
- **Case has been much better made for large facilities (no-brainer) and needs to be appropriately articulated for other facilities and programs**
  - Nanoscience centers are an exciting example
  - Support but don't compete with universities – you won't win!